BULLETIN
of the
Chicago Herpetological Society

Volume 50, Number 2
February 2015

BULLETIN OF THE CHICAGO HERPETOLOGICAL SOCIETY
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The *Bulletin of the Chicago Herpetological Society* (ISSN 0009-3564) is published monthly by the Chicago Herpetological Society, 2430 N. Cannon Drive, Chicago IL 60614. Periodicals postage paid at Chicago IL. **Postmaster:** Send address changes to: Chicago Herpetological Society, Membership Secretary, 2430 N. Cannon Drive, Chicago IL 60614.

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Bull. Chicago Herp. Soc. 50(2):13-18, 2015

A Synopsis and Larval Description of *Hynobius kimurae* Dunn 1923 (Caudata: Hynobiidae)

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Abstract

A species synopsis and larval description of an endemic Japanese salamander (family Hynobiidae: *Hynobius kimurae*) are presented. Larval characters of *Hynobius kimurae* (which exhibits both stream and pond characters) are compared with those of other hynobiid species.

Introduction

The salamander family Hynobiidae (59 species and 9 genera) is almost exclusively Asiatic in distribution (Zhang et al., 2006), monophyletic (Larson and Dimmick, 1993) and considered to be the most primitive of salamander families (Dowling and Duellman, 1973). The center of origin of the Hynobiidae was once thought to be central China (Fei and Ye, 1984) but is now considered to be northern China (Zhang et al., 2006). Many unnamed cryptic species (i.e., species which cannot be determined morphologically but only by molecular methods) have been postulated to exist recently (Matsui et al., 2000, 2004; Nishikawa et al., 2001; Tominaga et al., 2005; Tominaga and Matsui, 2008; Yoshikawa et al., 2008; Yoshikawa, 2010). For example using molecular methods the Japanese hynobiid salamander *Onychodactylus japonicus* has been split recently into four species (*O. japonicus*, *O. nipponoborealis*, *O. kinneburi* and *O. tsukubaensis*) (Poyarkov et al., 2012; Yoshikawa et al., 2012; Yoshikawa and Matsui, 2013), and now 23 hynobiid species occur in Japan (AmphibiaWeb, 2014). All hynobiid species found in Japan are endemic (Goris and Maeda, 2005) except for *Salamandrella keyserlingii*, which ranges from Hokkaido (the northern island of Japan) to eastern Europe. Japanese *Hynobius* species have been characterized as being lentic (pond-dwelling) or lotic (mountain brook- or stream-dwelling) (Sato, 1943; Matsui, 1979) and reproduce by external fertilization with eggs enclosed in arc-shaped gelatinous sacs (Matsui, 1979). Lentic forms have a diploid chromosome number of either 40 or 56, a compressed tail, and ovaries with numerous, relatively small ova. After hatching their larvae have a pair of balancers and a small yolk sac. Lotic forms have a diploid chromosome number of 58, a cylindrical tail, and ovaries with few but larger ova. Their larvae lack balancers at hatching and have a large yolk sac (Sato, 1943; Matsui, 1979).

Hynobius kimurae Synopsis:

H. kimurae is distributed (Figure 1) from 200-1000 m in altitude in the mountain brooks of the Kanto and Chubu district of eastern Honshu, the Chubu and Kinki district of central Honshu, and the Chugoku district of western Honshu (Shinozaki, pers. comm., Matsui et al., 2000).

The common name of *H. kimurae* is the *Hida Sansho-uo* with *Sansho-uo*, meaning salamander in Japanese. It is a lotic breeding *Hynobius* (Matsui et al., 2000) that breeds from late February through May (Matsui, 1979; Miyazaki and Akita, 1981; Goris and Maeda, 2005). Males use a mating swarm and enlarged hind legs during the breeding season to hold and externally fertilize the deposited ovisacs (Hasumi, 2001). Deposited eggs (12–26/ovisac) have a mean diameter of 5.0 mm (Misawa, 2001; Goris and Maeda, 2005). Ovisacs vary from 17.0–20.0 mm in width and 170–180 mm in length and are attached to rock undersides (Figure 2) at headwaters of mountain brooks with slow or weak currents (Matsui, 1979). The ovisac pellicle lacks striations, has a purplish shine, and is very thick and gelatinous

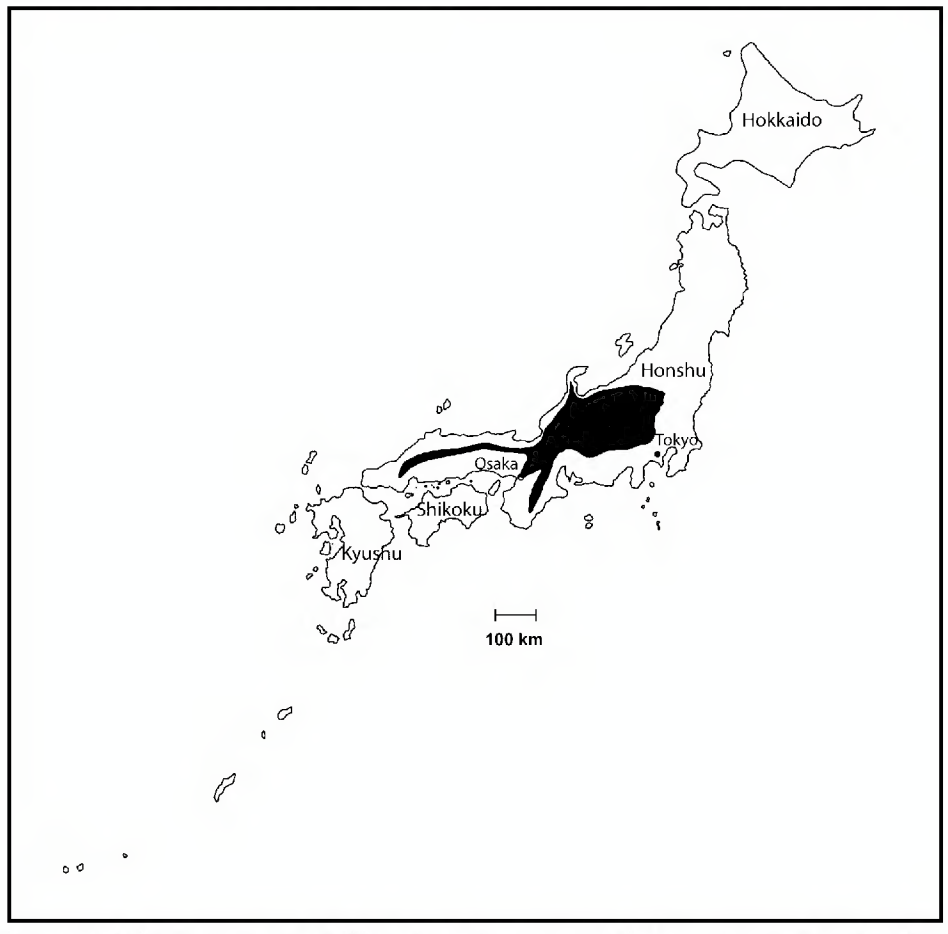

Figure 1. Distribution of *Hynobius kimurae* in Japan. A composite of distribution maps courtesy of Naoshi Shinozaki and Matsui et al. (2000).

Figure 2. *Hynobius kimurae* ovisacs attached to the underside of a stone in a mountain brook. Photograph courtesy of Sumio Okada.

Figure 3. An adult *Hynobius kimurae*. Photograph by Naoshi Shinozaki.

(Sato, 1943; Goris and Maeda, 2005). Adults exhibit no parental care (Sato, 1943). Time to larval hatching is about five weeks at 12.0 mm snout–vent length (SVL). They may possibly overwinter (December through February) and metamorphose at a mean SVL of 29.5 mm (Misawa and Matsui, 1997) but most undergo metamorphosis at a mean SVL of about 20.0 mm in late summer or early fall of their first year (Miyazaki and Akita, 1981; Misawa and Matsui, 1997). Karyotype was determined by Ikebe and Kohno (1991). They have large numbers of microchromosomes which are considered an ancestral trait for salamanders (Zhang et al., 2006). Adults (Figure 3) are blackish gray dorsally with bright irregular yellow-orange flecks, have long rows of palatine teeth, a pale venter, a short thick tail and usually 13 (sometimes 14) costal grooves (Goris and Maeda, 2005). Epidermal tarsal claws are present on the digits of larvae but are not well developed in adults (Goris and Maeda, 2005). Adult males have a mean SVL range of 63–71 mm while adult females have a mean SVL range of 73–77 mm (Misawa and Matsui, 1997). Using skeletochronology, Misawa and Matsui (1999) found males to mature at 5–6 years and females at 7–8 years. Matsui et al. (2009) described morphological variation and found two major groups in eastern and central Honshu.

Nakamura and Ueno (1963) believed that *H. kimurae* was a subspecies of *H. naevius*. Matsui et al. (1992) determined systematic relationships of *H. kimurae* with three other Japanese hynobiid species and found that *H. kimurae* was the sister group. Kuro-o et al. (1992) determined the phylogenetic relationships of nine Japanese hynobiid species and found a large phylogenetic distance between *H. kimurae* and other *Hynobius* species and believed it warranted placement in a different genus. Matsui et al. (2000) examined genetic divergence of *H. kimurae* with the closely related *H. naevius* and determined that *H. kimurae* deserved specific recognition and that there was also a cryptic species (although not named) present. At present, however, *H. kimurae* is considered a distinct species within the genus *Hynobius* (Frost, 2015).

Hynobiidae Larval Description Summary:

Although a wealth of information exists concerning larval salamander life histories (see Bruce [2005] for a review), there are a limited number of larval morphological descriptions (Brandon, 1961, 1964; Valentine and Dennis, 1964, Anderson and Martino, 1966; Valentine, 1989; Duellman and Trueb, 1986). Salamander larval types (mountain brook, pond, and stream) have been described by Valentine and Dennis (1964) and Duellman and Trueb (1986). The developmental stages of *Onychodactylus japonicus* (Iwasawa and Kera, 1980) and *H. nigrescens* (Iwasawa and Yamashita, 1991) and some larval characters of *O. japonicus* (Noble, 1931) have been published. There are other very brief descriptive notes on non-Japanese larval Hynobiidae: *Iranodon gorganensis* (Ebrahimi et al., 2004, as *Batrachuperus gorganensis*) and *I. persicus* (Kami, 2004, as *Batrachuperus persicus*) from Iran and *H. sonani* and *H. formosanus* from Taiwan (Kakegawa et al., 1989). Reilly (1983) described larval *Afghanodon mustersi* (as *Batrachuperus mustersi*) from Afghanistan which to date is the most in-depth larval hynobiid description. Herein, hatchling and metamorphic *H. kimurae* larvae are described.

Table 1. Mean (± SEM) and range for morphometric characters of stage 63 or 64 *Hynobius kimurae* larvae (N = 5). All measurements in mm.

Character	Mean ± SEM	Range
Eye diameter	1.39 ± 0.44	1.14–1.86
Head length	7.64 ± 0.77	6.71–8.29
Head width at widest point	7.44 ± 1.70	6.00–8.57
Hindlimb length	6.00 ± 0.97	4.57–6.40
Forelimb length	4.89 ± 1.47	3.43–5.43
Trunk width	6.05 ± 1.33	4.71–6.86

Materials and Methods

Two *H. kimurae* ovisacs were obtained 3 June 1989 by the junior author (Japan Amphibian Laboratory (JAL), Nikko, Tochigi Prefecture, Japan), who collected them in the nearby Irozaki mountain brook. They were transported to Southern Illinois University, Carbondale, Illinois, USA 62901 where the 20–25 larvae were maintained after hatching in 3.8-l bowls in distilled water at room temperature and fed live brine shrimp and later bloodworms as they grew in size. Five larvae were preserved in 10% formalin, stored in 70% ethyl alcohol, and deposited at the Southern Illinois University Carbondale Fluid Vertebrate Collection. Larval descriptions of these five larvae were made with a Nikon stereomicroscope equipped with an ocular micrometer. Larvae were developmentally staged based on the stages of the congener *Hynobius nigrescens* (Iwasawa and Yamashita, 1991).

Newly hatched larvae were described from a black-and-white photographic print. Morphological characters of the preserved metamorphic larvae were measured to the nearest 0.01 mm. Measurements of eye diameter (ED), head length (HL), head width at widest point (HW), hindlimb length (HLL), forelimb length (FLL) and trunk width (TW) were made. Mean melanophore and skin granule size (N = 20) to the nearest 0.01 mm were also determined. Results of these measurements are shown in Table 1 as sample mean, standard error of the mean (± SEM)

and range. Snout–vent length (SVL) was measured to the nearest mm with a metric ruler.

Results

Newly hatched larvae: The description of *H. kimurae* larvae is based on a black-and-white print (Figure 4) and is without size measurements. Larvae are stage 41 or 42 and recently hatched, lacking balancers and hind limb buds. There are rudimentary front limb buds without digits. Three gill rami are present on a very long rachis and each rami has two rows of few but extremely long gill fimbriae. Brown melanophores (sometimes in flecks) are scattered over the dorsum including the head. It was not possible to tell if brown melanophores were on the ventral surface due to photo limitations. Both dorsal and ventral caudal tail fins are low, long and have numerous brown melanophores. The dorsal fin ends slightly anterior of the vent. Due to photo limitations the end of the ventral fin cannot be determined. The yolk sac is extremely large and has some lateral and dorsal melanophores. The eye iris is oval and black, and there are no eyelids.

Preserved metamorphic larvae: Larvae in Figure 5 are stage 63 or 64 with SVL ranging from 24.0 to 27.0 mm; $\bar{x}$ = 26.60 ± 0.40 mm SVL (N = 5). The body form is depressed with 13 costal grooves. The digits on both the front (4) and hind (5) limbs are long and cylindrical. Some fingers (those on the front limbs) are interdigitally webbed, while webbing between the toes (those on the hind limbs) is more prevalent. Larger larvae (27 mm SVL) are without or have very little finger or toe webbing. Relative length of digits (with a 1 being the shortest and listed with the most interior to the most exterior) on the fingers are 2, 3, 1, 4 while toe relative lengths are 3, 4, 2, 5, 1. Toe one is extremely small in length; $\bar{x}$ = 0.83, range = 0.71–1.00 mm. Very minute black tarsal or epidermal (keratinized) claws are present on the digit tips. Gill rakers are present and are toothlike and acute. Four pairs of gill slits are present. The fleshy ventral gular fold is continuous across and without a medial indentation. One larva (24 mm SVL) has long filamentous gills with many gill fimbriae (two rows) on each rami, while the larger larvae 27 mm SVL (N = 4) have very reduced gills with smaller fimbriae.

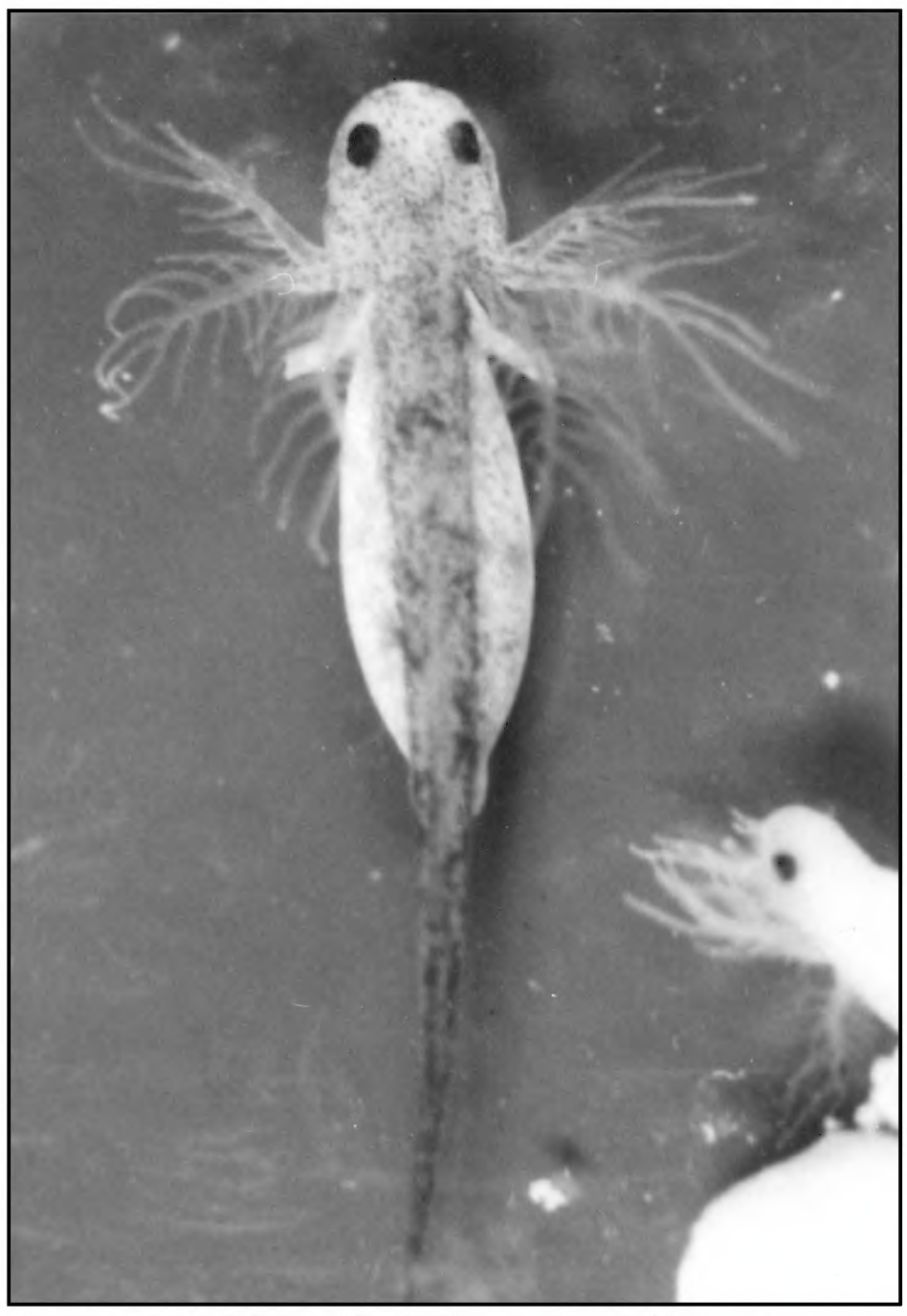

Figure 4. Newly hatched *Hynobius kimurae* larvae. Photograph by Naoshi Shinozaki.

The abdominal venter is cream colored without melanophores, while the ventral surface of the tail has some melanophores and the dorsum is strongly pigmented. The limbs have just a few dorsal brown melanophores; $\bar{x}$ = 0.87 + 0.65 mm. There is a small amount of brown melanophore mottling on the chin near the gular fold but the throat is unpigmented. The low caudal fin is mostly resorbed at this stage. The dorsal tail fin extends slightly anterior of the hind legs, while the ventral portion of the fin ends posterior to the vent and hind legs. There are many brown granules ($\bar{x}$ = 0.21 + 0.07 mm) on the dorsal skin of the body and tail. Eyelids are beginning to form. Table 1 gives morphometric character measurements of large metamorphic larvae and Table 2 compares habitat types and larval characters (presence or absence of lungs; tarsal claws or pads; interdigital webbing; and balancers) of *H. kimurae* with other larval hynobiid species.

Discussion

The presence of a large yolk sac in newly hatched *H. kimurae* larvae (Figure 4) may be significant as a possible food source in a resource-poor environment. *Onychodactylus japonicus* (a true mountain brook species) also retains the yolk sac late into development (stage 67; Iwasawa and Kera, 1980). Other lotic mountain brook- or stream-dwelling hynobiid species (*H. sonani*) also have a large yolk sac (Kagakawa et al., 1989).

All mountain brook- or stream-type larval hynobiid species (Table 2) have tarsal claws which are considered to be a mountain brook (lotic) character. Some pond-inhabiting (lentic) species, though, have tarsal claws (Goris and Maeda, 2005) although poorly developed (Table 2). The tarsal claws found in

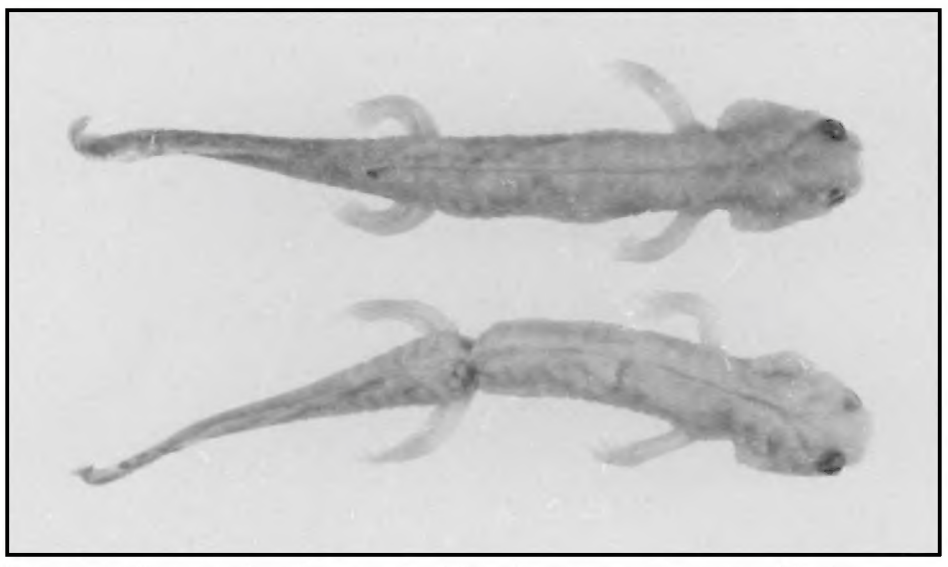

Figure 5. Preseved metamorphic *Hynobius kimurae* larvae. Photograph courtesy of Image of SIU-Carbondale.

Table 2. A comparison of characters of larval *Hynobius kimurae* with other larval Hynobiidae. Observations are based on Goris and Maeda (2004), Kuzmin and Thiesmeier (2001), Matsui et al. (1992), Kagakawa et al. (1989), Zhao et al. (1988) and Reilly (1983). NA = no information available.

Species	Country of origin	Lungs	Tarsal claws or pads	Interdigital webbing	Balancers	Habitat type
Hynobius kimurae	Japan	present	claws	yes	no	streams
H. stejnegeri	Japan	present	claws	NA	no	mountain brooks
H. naevius	Japan	present	claws	NA	no	mountain brooks
H. sonani	Taiwan	present	NA	NA	no	mountain brooks
H. nigrescens	Japan	present	none	yes	yes	ponds
Afghanodon mustersi	Afghanistan	reduced	claws	yes	yes	pools
Iranodon persicus	Iran	reduced	pads	yes	yes	cave streams / pools
Liua shihi	China	reduced	pads	NA	yes	streams
Onychodactylus japonicus	Japan	absent	claws	yes	no	mountain brooks / streams
Ranodon sibiricus	China	reduced	claws	poorly developed	no	mtn streams / marshes / lakes

H. kimurae larvae might be used to hold onto the substrate in fast moving water in a mountain brook or stream habitat. *Afghanodon mustersi* has both mountain brook (tarsal claws; Reilly, 1983) and stream characters (balancer; Nawabi, 1965) although balancers are actually considered a pond character (Valentine and Dennis, 1964). *Afghanodon mustersi* larvae do live in pools, which is also considered a pond character. Noble (1931) described the lungless *O. japonicus* as having tarsal claws as adults in breeding condition. Tarsal claws are also found on other Japanese hynobiids (*H. stejnegeri*) (Goris and Maeda, 2005) and some populations of larval *H. boulengeri* and *H. naevius*, although there may be more than one cryptic species present (Matsui et al., 1992; Tominaga et al., 2005). Zhao et al. (1988) found tarsal claws on the Chinese hynobiid *O. fisheri* and also cornified coverings or sheaths, which they believe to be a more primitive character than tarsal claws, on the digits of *Batrachuperus* (4 species), and *Liua shihi*. *Ranodon sibiricus* (Hübener, 1960; Kuzmin and Thiesmeier, 2001) also has reduced lungs and larvae have tarsal claws.

Hynobius kimurae has other stream and mountain brook characters (Valentine and Dennis, 1964; Duellman and Trueb, 1986). The stream characters include 1.) presence of two rows of fimbriae on a very long rachis; 2.) a caudal fin which ends at the beginning of the tail; 3.) a depressed body; 4.) a straight across and non-indented gular fold and 5.) the absence of balancers.

Additional and more in depth morphological descriptions of Japanese hynobiid salamander larvae are needed to determine characters and variations at different stages of development. Molecular techniques are needed to make more complete species determinations of the cryptic hynobiid species found in Japan, especially in the genus *Hynobius*.

Acknowledgments

Don Sparling, John Palis, Jodi Huggenvik, Joe Cheatwood, Sam Spiller and Aimee Reel Hemphill critically reviewed the manuscript. Ron Brandon is appreciated for his help in many ways. Fumiko Kanekawa translated the Japanese publications. We also thank the U. S. Fish and Wildlife Service for allowing us to legally import the egg cases of *H. kimurae*.

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Notes on Reproduction of Twin-spotted Spiny Lizards, *Sceloporus bimaculosus* (Squamata: Phrynosomatidae), from New Mexico

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Abstract

The results of a histological examination of *Sceloporus bimaculosus* gonadal material from New Mexico are reported. *Sceloporus bimaculosus* exhibits a seasonal reproductive cycle in which reproduction commences in early spring and concludes in August. Mean clutch size (n = 5) was 8.6 ± 2.5 SD, range = 5–11. Neonates (32–33 mm SVL) were found in August. My data confirm that timing of events in *S. bimaculosus* parallels that of other members of the *Sceloporus magister* complex.

Sceloporus bimaculosus as defined by Schulte et al. (2006) occurs in southeastern Arizona, southern New Mexico, west Texas, northern Chihuahua, western Coahuila and northeastern Durango (Webb, 2009). In New Mexico *S. bimaculosus* (as *Sceloporus magister*) has been observed from late March to mid-November (Degenhardt et al., 1996). Webb (2009) reported *S. bimaculosus* reproduces from early spring into late summer with egg clutches numbering 2–19. Previous information on *S. bimaculosus* reproduction was reported under *Sceloporus magister* (Parker and Pianka, 1973). In this paper I report results of a histological analysis of *S. bimaculosus* gonadal material as part of an ongoing series of studies on the timing of events in the reproductive cycles of North American lizards.

Methods

A sample of 65 *S. bimaculosus* consisting of 28 adult males (mean snout–vent length, SVL = 100.1 mm ± 10.9 SD. range = 78–113 mm); 16 adult females (mean SVL = 90.6 mm ± 7.5 SD, range = 80–100 mm), 4 subadult males (mean SVL = 61.5 mm ± 7.6 SD, range = 53–71 mm), 15 subadult females (mean SVL = 64.5 mm ± 5.4 SD, range = 56–73 mm), 2 neonates (mean SVL = 32.5 mm ± 0.71 SD, range 32–33 mm) was examined from the herpetology collection of the Los Angeles County Museum of Natural History (LACM), Los Angeles, California, USA. *Sceloporus bimaculosus* were collected 1947–1970. *Sceloporus bimaculosus* are listed by New Mexico County in the appendix. Most *S. bimaculosus* are from Doña Ana County.

A small incision was made in the lower part of the abdomen and the left gonad was removed for histological examination. Gonads were embedded in paraffin, sections were cut at 5 μm and stained with Harris hematoxylin followed by eosin counter-stain (Presnell and Schreibman, 1997). Histology slides were deposited in LACM. Enlarged ovarian follicles (> 4 mm length) or oviductal eggs were counted. An unpaired *t*-test was used to test for differences between adult male and female SVLs using Instat 3 (Graphpad, San Diego, CA).

Results and Discussion

Mean SVL of males was significantly larger than that of females (unpaired *t* test, $t = 3.1$, $df = 42$, $P = 0.003$). Monthly stages in the testicular cycle are in Table 1. Three stages were present: (1) regressed, seminiferous tubules are at their smallest sizes and contain spermatogonia and interspersed Sertoli cells; (2) recrudescence, a proliferation of germ cells has commenced for the next period of spermiogenesis and is marked by the presence of spermatogonia, primary and occasional secondary spermatocytes; (3) spermiogenesis, lumina of the seminiferous tubules are lined by sperm or groups of metamorphosing spermatids. The period of spermiogenesis (sperm production) encompassed April to July. The smallest reproductively active male measured 85 mm SVL (LACM 4503) and was collected in April. The actual size when males commence reproductive activity may be somewhat smaller and could have escaped detection due to my small male sample. Consequently, two slightly smaller males (SVL 78, 79 mm) with regressed testes from July and August, respectively, were arbitrarily considered as adults. Four subadult males each contained regressed testes.

Monthly stages in the ovarian cycle are in Table 2. Four stages were present: (1) quiescent, no yolk deposition in progress; (2) early yolk deposition, basophilic yolk granules in the ooplasm; (3) enlarged ovarian follicles (> 4 mm); (4) oviductal eggs. The period of female reproductive activity encompassed April to July.

Mean clutch size (n = 5) was 8.6 ± 2.5 SD, range = 5–11. One vitellogenic July female (Table 2) was undergoing follicular atresia, a process in which the yolk granules are phagocytized by enlarged granulosa cells (Goldberg, 1970). This is commonly seen late in the ovarian cycle when females do not complete yolk deposition (Goldberg, 1973). The smallest reproductively active female measured 80 mm SVL (LACM 133294) and was

Table 1. Monthly stages in the testis cycle of 28 adult *Sceloporus bimaculosus* males from New Mexico.

Month	N	Regressed	Recrudescent	Spermiogenesis
April	2	0	0	2
May	10	0	1	9
June	6	0	0	6
July	3	2	0	1
August	6	6	0	0
September	1	0	1	0

Table 2. Monthly stages in the ovarian cycle of 16 *Sceloporus bimaculosus*; * one July female was undergoing atresia, ** another July female contained damaged enlarged follicles that could not be counted.

Month	N	Quiescent	Early yolk deposition	Enlarged follicles > 4 mm	Oviductal eggs
April	2	0	1	1	0
May	3	0	1	2	0
June	4	2	1	0	1
July	6	2	2*	1**	1
August	1	1	0	0	0

collected in April. Fourteen subadult females each contained quiescent ovaries. Two neonates, SVL = 32, 33 mm respectively, were collected in August. This is the size range for hatchlings in Parker and Pianka (1973).

Parker and Pianka (1973) reported on timing of events in the female cycle of *S. bimaculosus* (as *S. magister*) from Doña Ana County, New Mexico. Females contained enlarged follicles (> 4 mm) from April to early August with first egg clutches deposited between mid-May to late June. Parker and Pianka (1973) reported one oviductal female exhibited concurrent yolk deposition for a second egg clutch in late May. My failure to report a female *S. bimaculosus* producing multiple clutches may have resulted from my small sample size of gravid females (Table 2).

In conclusion, my data confirm that timing of events in *S. bimaculosus* parallels that of other members of the *Sceloporus magister* complex which also breed during spring (Goldberg, 2012). This strategy of spring reproduction is followed by approximately 91% of lizards from western North America (Goldberg, 2014).

Acknowledgments

I thank Greg Pauly (LACM) for permission to examine *S. bimaculosus*.

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Appendix

Sceloporus bimaculosus from New Mexico (LACM) examined by county: **Doña Ana**: LACM 4496 4503, 113577-113593, 113595 113604, 113606 113611, 133292-133305; **Luna**: LACM 61876, 113612 113615, 182365; **Sierra**: LACM 4504; **Socorro**: LACM 4505, 96139, 113576.

Herpetology 2015

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

ECOLOGY OF *SPILOTES PULLATUS*

O. A. V. Marques et al. [2014, Herpetologica 70(4):407-416] note that few extensive studies have addressed the ecology of South American colubrids. *Spilotes pullatus* is a large and conspicuous colubrid snake with a broad distribution in South America. The authors analyzed the morphology, habitat use, diet, feeding behavior, and reproductive biology of *S. pullatus* in a subtropical area of distribution, specifically in the Atlantic Forest of southeastern Brazil, and compared its ecological traits with those of other South American colubrids to identify common characteristics and differences among these snakes. *Spilotes pullatus* inhabits primarily lowland areas and readily occurs in altered habitats. Male and female snakes were similar in median snout–vent length, but the largest known individuals of the species are males. This snake forages actively by day, searching primarily for small mammals and nestling birds (usually 0.36–7.37% of snake mass) on the ground or in vegetation. Observations of captive snakes showed that small prey are quickly swallowed alive, whereas large prey are constricted or pressed against the substrate and die before swallowing. The reproductive cycle of the females appears to be seasonal, with vitellogenesis occurring from the middle of the dry season to the onset of the rainy season. Mating was recorded at the end of the dry season and the onset of the rainy season and coincided with the onset of male–male combat. Such combat behavior includes partial entwining of the anterior portions of the body and a consistent, upright position of the trunk. Recruitment of newborns occurs at the end of the rainy season and during the dry season. *Spilotes pullatus* shows unique characteristics but also shares several ecological traits with other South American colubrids.

SURVIVAL OF TOE-CLIPPED LEOPARD FROGS

N. A. Ginnan et al. [2014, Copeia 2014(4):650-653] note that toe clipping is commonly used to identify individual frogs in mark–recapture studies. However, Institutional Animal Care and Use Committees (IACUCs) often have reservations about approving studies that include toe clipping as a way to mark animals. Previous studies indicate that recapture rates of terrestrial frogs and toads decrease with increasing numbers of toes clipped. It is not known whether these decreases are due to decreased survival rates, increased avoidance of recapture, or some other reason. The goal of this paper is to provide IACUCs with a quantitative analysis of the effects of toe clipping on survival so that they can make informed, data-based decisions when approving studies using this method, rather than basing decisions on anthropomorphic biases. The authors conducted a large (n = 100) laboratory experiment to determine the effects of toe clipping on the frog *Rana pipiens*. No evidence was found that the number of toes clipped affected either the survival rate of leopard frogs or the number of days that frogs survived over a 13-week period.

PREDATION ON RINGED SALAMANDER EGGS

D. L. Drake et al. [2014, Herpetologica 70(4):378-387] note that predation is a key determinant of pond community structure, yet not all predators are equally effective and not all life stages of potential prey are similarly susceptible. Understanding the effects of native and introduced species is essential to informing management strategies, especially for endemic and species of conservation concern. The authors examined the effects of five common predators (three native: central newts [*Notophthalmus viridescens louisianensis*], aeshnid dragonfly naiads [Aeshnidae], and southern leopard frog tadpoles [*Lithobates sphenocephalus*]; and two introduced: Fathead minnows [*Pimephales promelas*] and mosquitofish [*Gambusia affinis*]) on survival of eggs and recently hatched larvae of ringed salamanders (*Ambystoma annulatum*). They also examined the effect of supplemental food or cover availability on survival at each stage. Predators primarily showed a binary response to eggs, consuming all or none of them. Supplemental food did not influence whether eggs or larvae were consumed. Larvae were consumed by all predator species although the effect varied. The presence of cover did not reduce the impacts of the other predators on larval survival. Overall, the two introduced fish species had a greater impact on survival of the early stages of ringed salamanders than did the native predators. Further inquiries into the susceptibility of different life stages and survival will improve conservation strategies for rare and endemic species such as ringed salamanders.

LEAF LITTER AND POPULATION DENSITIES

S. M. Whitfield et al. [2014, Copeia 2014(3):454-461] note that loss of biodiversity within relatively pristine protected areas presents a major challenge for conservation. At La Selva Biological Station in the lowlands of Costa Rica, amphibians, reptiles, and understory birds have all declined over the past four decades, yet the factors contributing to these declines remain unclear. The authors conducted two tests of the hypothesis that faunal declines are linked to shifting dynamics of leaf litter, a critical microhabitat for amphibians and reptiles and a major component of forest carbon cycles. First, they conducted a 16-month manipulation of leaf litter and measure response by terrestrial amphibians and reptiles. Second, they synthesized three year-long datasets collected over four decades to evaluate potential multi-decade change in standing litter depth. The results show that litter depth regulates density of amphibians and reptiles, and that the strongest response to manipulations is in species that decline most rapidly based on long-term data. Synthesis of litter depth data suggests considerable interannual variability in standing stocks of leaf litter with lowest quantity of leaf litter in the most recent sampling period. These tests are consistent with the hypothesis that these faunal declines may be in part driven by changes in forest litter dynamics, and ultimately to climate-sensitive carbon cycles.

Unofficial Minutes of the CHS Board Meeting, January 16, 2015

Vice-president Rich Lamszus called the meeting to order at 7:42 P.M. Board members John Archer, Ed Huether, Aaron LaForge and Erica Mede were absent.

Officers' Reports

Treasurer: Mike Dloogatch gave the financial report. Mike moved that up to $10,000 be allocated for grants for the year 2015. Motion passed unanimously.

Sergeant-at-arms: Dick Buchholz informed the board that there were 44 people at the December holiday party / meeting.

Committee Reports

Shows:
• Notebaert Nature Museum, first full weekend of each month.
• Reptile Rampage, Lake Forest, March 8.
• Chicagoland Family Pet Expo, Arlington Racetrack, March 20–22.
• NARBC, Tinley Park, March 14–15.
Molly Carlson discussed upcoming shows. The Sportsman Show is ready for us and enough members have volunteered to participate. Molly stated that Walker Stalker Con (Feb. 21–22) would give us a table but we would have to pay for electricity. Consensus of the board was that Molly should negotiate with them to waive that fee.

Junior herpers: Rich Lamszus reported that there were 54 in attendance at the last meeting. Vince Sourile (a ball python breeder) will speak at the February meeting. Rich also stated that his blog is doing well. Colleen brought up the topic of being able to bring kids on a herping trip and wondered if liability is a problem.

Adoptions: Colleen listed a few animals that have come in for adoption. The use of a relinquish form was discussed. Colleen may need to purchase supplies for future rescues.

Old business

Herp of the Month: January theme is "Yellow."

Storage options: Teresa Savino looked into different storage places for CHS supplies, trailer and records. Finding space for the trailer may be difficult because most facilities do not have fenced-in, gated lots.

Rules for Adoption: Should we have written rules for the CHS adoption program?

Operating procedures: Erica Mede has prepared a draft manual of standard operating procedures for the CHS, including job descriptions for all officers. A committee meeting will be held to discuss this.

Round Table

Dick Buchholz has been receiving donations for the CHS by using a jar at the shows he attends.

Molly Carlson announced she is gender fluid, and uses the male name Malcolm.

Rachel Fessler is looking to adopt an iguana.

Colleen will be having a cherished pet horned lizard euthanized.

Rich has been getting more Mexican black kingsnakes.

Mike Dloogatch thanked the Taco Wizard for bringing in food for the December 2014 CHS holiday meeting. Also thanked Colleen for the potato casserole.

Meeting adjourned at 9:38 P.M.

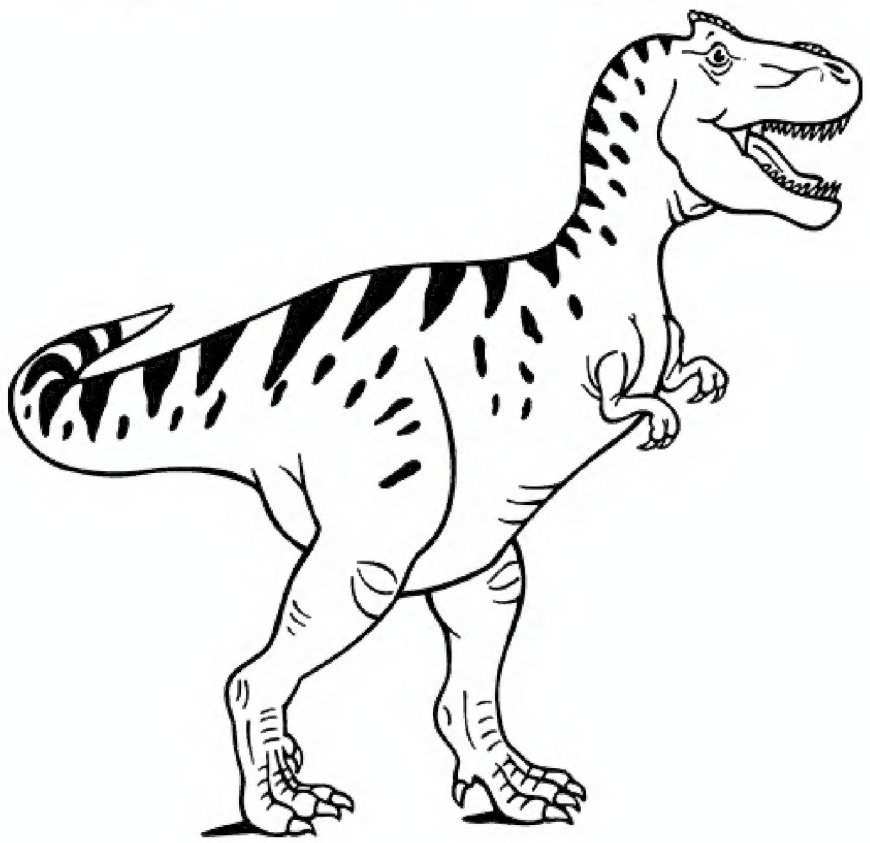
Respectfully submitted by Rachel Fessler

2015 CHS GRANT RECIPIENTS

The CHS Grants Committee has chosen the CHS grant recipients for 2014. The committee consisted of John Archer, Michael Dloogatch, Robert Jadin, Linda Malawy, Sarah Orlofske, Amy Sullivan and Steve Sullivan. This year we received 27 applications. After a difficult decision process, 8 grants were awarded, in varying amounts, as follows:

- Anthony Carmona, Department of Biology, Northeastern Illinois University. "Re-describing a Lost Species from North America: The Forgotten Vine Snake *Oxybelis microphthalmus*," $1,000.
- Madeline Cooper, Department of Biological Sciences, Humboldt State University. "Examining Invasive Bullfrog (*Rana* [*Lithobates*] *catesbeiana*) Movement Patterns on the Trinity River," $1,000
- Chris Lechowicz, Sanibel-Captiva Conservation Foundation. "SCCF Pine Island Sound Eastern Indigo Snake Project," $1,000.
- John G. Palis, Palis Environmental Consulting. "Do Crawfish Frogs Still Occur in Westernmost Illinois?," $500.
- Aaron Reedy, Department of Biology, University of Virginia. "An Evolutionary Battle of the Sexes: Using a Reptile Model to Examine Sexual Conflict and the Genetic Basis of Fitness," $1,000.
- Jason Ross, Illinois Natural History Survey, Prairie Research Institute, University of Illinois Urbana-Champaign. "Spatial Ecology of the Smooth Softshell Turtle (*Apalone mutica*) in the Kaskaskia River of Illinois," $1,000.
- Alex Shepack, Department of Zoology, Southern Illinois University. "Back from the Dead?: Rebounding Amphibian Populations with an Enzootic Pathogen," $1,000.
- K. Nicole White, University of Georgia and Archbold Biological Station. "Social Dynamics of a Long-Lived Reptile," $1,000.

If you've got one, bring it!



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For sale: Captive-bred Rosy Boas. Forty-year C.H.S. member is selling 2011 and 2013 healthy and excellent feeding offspring. Special "cheap" prices to C.H.S. members. Arrangements can be made for delivery to southern Wisconsin or northern Illinois. Phone (608) 427-3864 or email zartenfour@mwt.net.

For sale: Standard 24" Neodesha reptile cages, 3 × 6" vent on top, tempered glass front. Like new condition, no burns or stains, original glass. These cages do not have the dam (horizontal molding that crosses the entire front width of the cage, used to hold back bedding material)—easier to clean without the dam. About 20 currently available, $45 each. Linda Malawy, (630) 717-9955, linda_malawy@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper Midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are $125 ea., Sri Lankans (2012 hatched) $475 ea. And Pancakes are $195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

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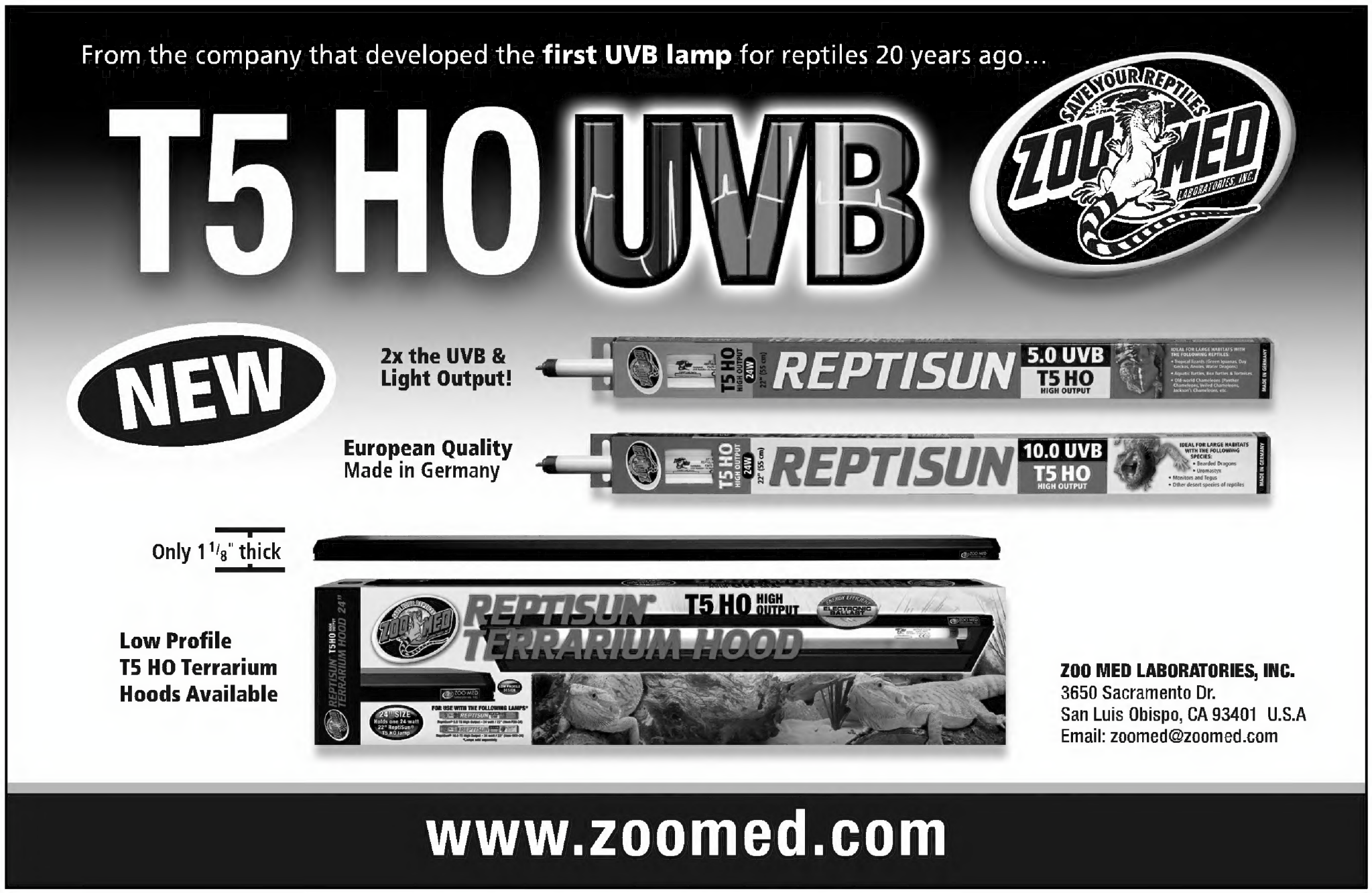
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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, February 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Dan Krull**, of Shawnee, Kansas, will speak about a project he has been working on: textiles made from shed skins as an alternative to the skin trade. Dan is familiar to many of you as a past talk show host for Herp Nation Media.

At the March 25 meeting, **Danny Mendez** will speak on a topic yet to be decided. Danny runs UrbanJunglesRadio, a live Internet radio show and podcast.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

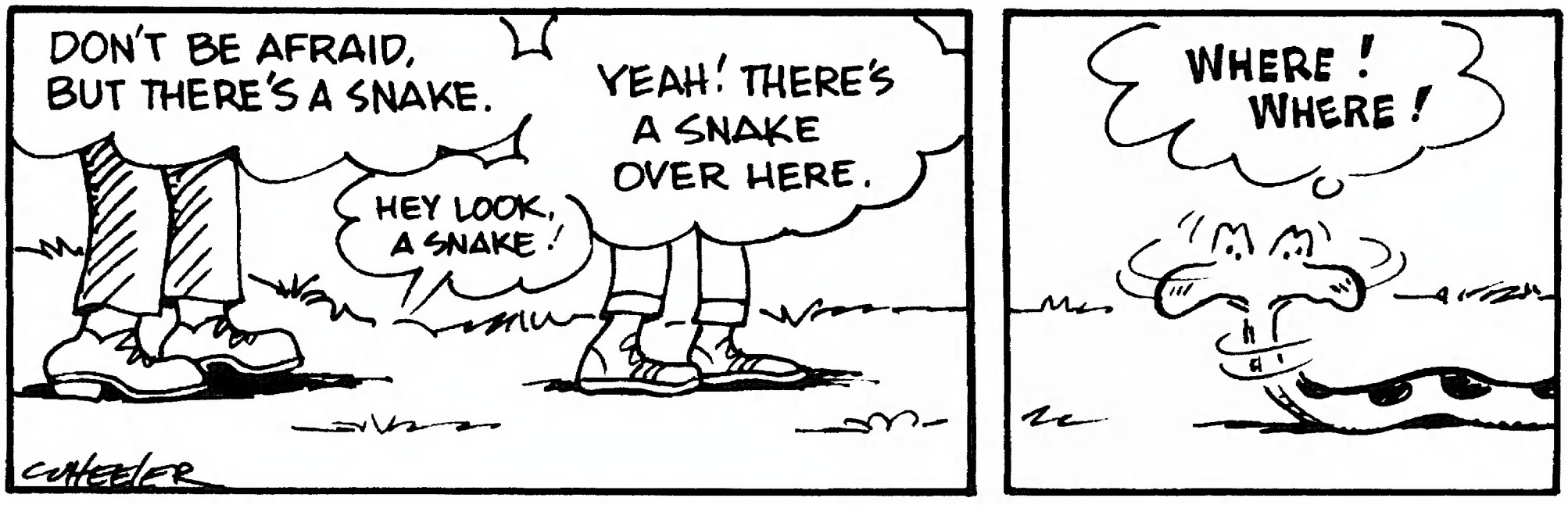
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., Friday, March 13, 2015, at the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group's Facebook page.

THE ADVENTURES OF SPOT



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